DYNAMICAL MOMENTS OF INERTIA AND WOBBLING MOTIONS IN TRIAXIAL SUPERDEFORMED NUCLEI

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One of the most striking findings in the recent high-spin spectroscopy is the discovery of one-phonon, and possibly double-phonon, excitation of the nuclear wobbling rotational bands. The wobbling motion is a spinning motion of the asymmetric top, where the body rotates *non-uniformly* around a *non-inertia* axis. Namely, it is a genuine three dimensional rotational motion, and the non-axiality of nuclear moments of inertia is essential. Since the atomic nucleus is neither a rigid-body nor a simple irrotational fluid, it is highly non-trivial that such an idealized motion of the asymmetric rotor is realized.

In the RPA formalism, the excitation energy of the wobbling motion is given by the same expression as that in Bohr-Mottelson's rotor model except that $\mathcal{J}_{y,z}$ are $\omega_{\rm rot}$ dependent. That expression requires $\mathcal{J}_x > \mathcal{J}_y, \mathcal{J}_z$ for the existence of the wobbling mode, whereas an irrotatinal-like inertia for the expected $\gamma \simeq +20°$ shape gives $\mathcal{J}_y > \mathcal{J}_x$. We solved this puzzle by considering the alignment effect of the $\pi i_{13/2}$ quasiparticle(s).

In this talk, we would like to discuss the wobbling motion from a microscopic view point based on the cranked shell model plus RPA [1]. We not only analyze the data for odd-Z Lu isotopes but also give some predictions for even-even Hf ones.

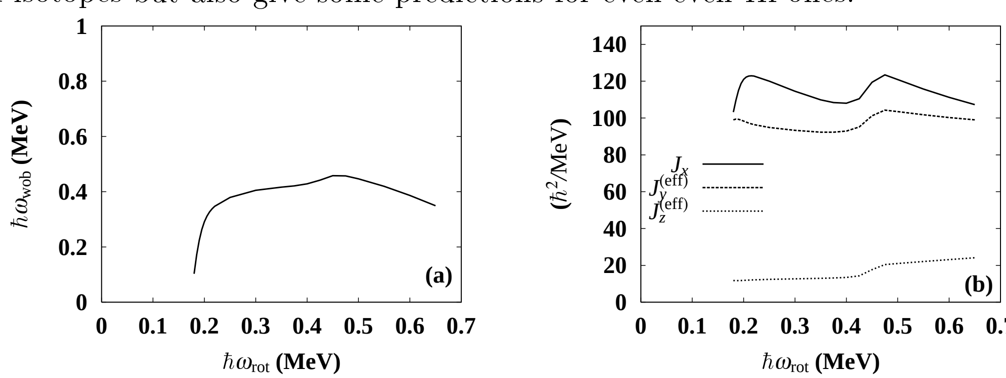

Figure 1: Rotational frequency dependence of (a) excitation energy of the wobbling motion, and (b) three moments of inertia associated with the wobbling motion in ^{168}Hf, calculated with $\epsilon_2 = 0.43$, $\gamma = 20°$ and $\Delta_n = \Delta_p = 0.3$ MeV. Note that the wobbling mode emerges at $\hbar\omega_{\rm rot} \geq 0.18$ MeV associated with the rotational alignment of the $i_{13/2}$ proton pair.

References

[1] M. Matsuzaki, Y. R. Shimizu, and K. Matsuyanagi, Phys. Rev. **C65** (2002), 041303(R); *ibid.* **C69** (2004), in press.